

## The Present Range of *Potamogeton crispus* L. in North America

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The afternoon of August 24, 1928, while Dr. David H. Thompson and the writer were engaged in a brief survey of the aquatic plants making up the weedbeds of Lake Nippersink, in Illinois, we picked up a fragmentary branch of *Potamogeton crispus*. In the short time then at our disposal, we were not able to make a thorough search for more of it; but as other pondweeds, such as *P. americanus*, *P. Richardsonii*, *P. compressus*, and *P. foliosus*, were obtained in abundance during the afternoon, it is probable that *P. crispus* was not abundant there. This small specimen, taken by chance, provides the only record we have of the occurrence of the plant in that lake; and it is, moreover, the only specimen of *P. crispus* that we have obtained in Illinois waters, though during the past four seasons we have collected in many places.

This pondweed is considered to be an introduced species, possibly of European origin; and both the manuals and the monographs agree in assigning to it a very limited range in a few East Coast States. The latest range, as given in Norman Taylor's<sup>1</sup> monograph of 1909 is from "Ontario to Delaware and eastern Pennsylvania." As our specimen seemed, in contrast with this, to indicate a considerable westward extension, I undertook to search out additional evidence of its spread, both as recorded by specimens deposited in herbaria and by printed observations.

The earliest printed note on the range extension of the species is by Dr. Morong,<sup>2</sup> who inadvertently made it a matter of record at the Buffalo meeting of the "American Association" that *P. crispus* had occurred in Arizona. This was seven years before the appearance of his monograph<sup>3</sup>; but in the monograph itself he does not mention the Arizona instance, probably because he supposed it to have been too rare and far removed from the abundant range to be duplicated soon.

<sup>1</sup> North American Flora 17<sup>1</sup>: 21-22.

<sup>2</sup> Bull. Torrey Bot. Club 3: 171. 1886.

<sup>3</sup> Memoirs of the Torrey Botanical Club 3<sup>2</sup>. 1893.

The only other significant note is Edwin D. Hull's report<sup>4</sup> in 1913 of the presence of *P. crispus* in the lagoons of Jackson Park, Chicago, and in Wolf Lake, Indiana. In these waters, which are in direct connection with Lake Michigan and close to the lakeshore, this pondweed had been well known to Mr. Hull since 1909; and in the lagoons it had become so abundant as to be a nuisance. But in Chicago's Washington Park, about a mile westward from the lakeshore, lagoons not connected with the lake yielded Mr. Hull no specimens.

Lake Nippersink, in which our chance collection was made, lies near the northwest corner of Lake County, 20 miles west of Lake Michigan and about 45 miles northwest of Jackson Park. It is one of a number of glacial lakes in Illinois and Wisconsin that are drained by the Fox River, a tributary of the Illinois River and one of the headwaters of the Mississippi System.

Our collection and Mr. Hull's note record, within a distance of 50 miles, the presence of this pondweed in two great river systems. There is, of course, direct water connection between the two, by way of the reversed flow of the Chicago River and the Drainage Canal; and if these were the only records at hand this might serve as a plausible though unlikely explanation of the two occurrences.

As a result, however, of the courteous response given my inquiries by the botanists in several important herbaria, I have at hand a large list of specimens of *P. crispus*, in which I find three citations of particular interest. From the Brooklyn Botanical Garden, Norman Taylor cites two specimens, the first taken by D. Griffiths in July, 1896 in Edmonds County, South Dakota, the second taken by D. Griffiths and E. L. Morris August 19, 1901 near Silvies in east-central Oregon. And from the University of Wisconsin Herbarium J. J. Davis has very obligingly sent for my inspection a specimen taken by N. C. Fassett and L. R. Wilson (No. 4348) August 26, 1927 from the Minnesota side of the Mississippi near Kellogg.

These records give to *P. crispus* an almost cross-continental range; but our Illinois specimen, in company with three Michigan specimens cited to me by Professor Darlington as having been collected in Van Buren County (L. H. Pennington, 1910) and in Black Lake and Pigeon Lake two years ago, as well as

<sup>4</sup> *Rhodora* 15: 171-172.

Professor Macoun's<sup>5</sup> much older record from the Canadian side at Niagara, furnishes conclusive evidence that this pondweed has for some years been well established westward. Indeed, it may be added that Professor Henry Oosting, who made the Black Lake and Pigeon Lake collections in Michigan, has written me that in 1928 he collected *P. crispus* in Lake Minnetonka, Minnesota, though at the time he received my inquiry he was not able to find his specimen.

The time when *P. crispus* was first brought to the North American continent, and the place in which it found its first foothold, must of course remain conjectural. With the exception of the two Americas, it is of nearly world-wide distribution, ranging through most of Europe, thence across Asia to Japan and Korea and southward into Africa and Australia. According to Arthur Bennett,<sup>5</sup> the oldest dated American specimen is labeled "Philadelphia, 1841-2. Gavin Watson & Kilvington," though "one from Delaware . . . is probably older; it was collected by R. Eglesfeld Griffith, of Philadelphia." It appears certain that this plant has been in American waters for a century—perhaps much longer—and its abundance in the East, shown by the preponderance of collections from that region, indicates that it may have become established there first.

Its subsequent spread westward might be attributed to a variety of agencies, but it seems to me most likely that aquatic birds have been the most important. There are more than 50 species which regularly visit the United States for some part of each year; those that breed commonly in the Northern States are of 19 species; and those that breed far northward but winter in the States number more than 20 species. For 16 important species of game ducks, McAtee<sup>6</sup> reports that pondweeds constitute from 4 to over 40 per cent. of the food and that the average proportion of pondweed in the food of these species is 13.88 per cent.

Commonest among our ducks is the Mallard. Wintering chiefly in the southern half of the Mississippi Valley, but also casually as far east as Massachusetts, it breeds in the summer throughout a large territory ranging from the northern States far into Canada. The Canvasback, formerly much more abun-

<sup>5</sup> Jour. Bot. 39: 201. 1901.

<sup>6</sup> U. S. Dept. Agr., Biol. Survey. Bull. 81. 1911.

dant that it now is, wintered in enormous numbers in the Chesapeake Bay region and in the spring followed the line of the Great Lakes northwestward for more than a thousand miles to breed in Alberta. No duck has a northwest-southeast migration more marked than that of the Scaup. In the winter, it is to be found in greatest abundance near the Atlantic Coast from



The relation of duck migration to the distribution of *Potamogeton crispus* in North America.

The range of *P. crispus* is shown by the black circles. In the East the small circles represent the general range of the plant, rather than individual localities, while the larger circles in the West mark the locations from which the isolated western collections were taken. The direction of the migration routes of the Canvasback and the Scaup are shown by the dotted arrowlines.

Chesapeake Bay to Massachusetts; but in the spring, generally following the chain of lakes from Ontario through to the Great Slave, it moves to a breeding ground that extends from North Dakota to Great Slave Lake, Sitka, and the entire length of the Aleutian Chain.

These birds are among the most voracious pondweed eaters. The figures given by McAtee in the paper mentioned above are:

of the Mallard's food 12.67 per cent. is pondweed; of the Canvasback, 42.35; and of the Scaup, 23.2 per cent.

When the localities represented by my list of specimens have been spotted on a map, the belt of occurrence shown thereby rather roughly resembles an old and well-worn broom. Beginning in the East, the loosened straws end along the Atlantic Coast, from Virginia and Chesapeake Bay northward to Massachusetts and Toronto. Thence westward, they converge, by way of the Susquehanna, Delaware, Hudson, and other streams, at Lake Ontario, where they are bound to the shaft. At Lake Michigan the upper ends of the bound strands have broken out in the Michigan and Illinois localities; and the course of the broom handle is marked, westward, by the isolated collections in Minnesota, South Dakota, and Oregon.

Though the lines of spread from the Atlantic inland are almost indistinguishable, the general course is that followed by migrating ducks; and it appears wholly reasonable to regard them as the carriers. Indeed, I cannot repress the suggestion that the bringing of the crisp pondweed to North America is attributable with far less certainty to the hand of man than to such birds as the European Widgeon, which has been caught straying on this continent more than eighty times.

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